

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for facilitating airborne free space optical communications between an airborne host platform and a link platform, each platform having an optical head which transmits and receives data via modulated infrared laser beams, wherein the host comprises at least an optical head having a fine, coarse, and ultrafine steering element configured in a cascaded three-tier steering element architecture, the method comprising;

obtaining a priori of pointing information from a network to identify a location of the link platform;

transmitting a beam directed to the link platform;

adjusting the coarse steering element to point the beam to the link platform within a first specified range of measured units;

locating a beacon of the link platform; and

dynamically focusing the beam to collapse the divergence of the transmitted beam down to a second specified range of measured units less than the first to facilitate tracking; and

tightening a field of regard for each successive tier within the cascaded three-tier steering element architecture to allow for finer steering resolution.

2. (Previously Presented) The method according to claim 1, wherein the first specified range of measured units is about 200-500 μ rad.

3. (Previously Presented) The method according to claim 1, wherein the second specified range of measured units is about 100 μ rad.

4. (Canceled)

5. (Previously Presented) The method according to claim 1, wherein the coarse-steering element has a first field of regard, the fine-steering element has a second field of regard less than the first field of regard, and the ultrafine-steering element has a third field of regard less than the second field of regard.

6. (Previously Presented) The method according to claim 1, wherein the coarse-steering element has a first bandwidth, the fine-steering element has a second bandwidth greater than the first bandwidth, and the ultrafine-steering element has a third bandwidth greater than the second bandwidth.

7. (Previously Presented) The method according to claim 6, further comprising correcting jitter utilizing a finest tilt parameter at the third bandwidth.

8. (Previously Presented) The method according to claim 1, wherein the coarse-steering element covers a range of about ± 45 degrees at about 20 Hz, the fine-steering element covers a range of about ± 3 degrees at about 200 Hz, and the ultrafine-steering element covers a range of about ± 100 μ rad at about 2000 kHz.

9. (Previously Presented) The method according to claim 1, wherein dynamically focusing includes defocusing the beam by utilizing an adaptive-optical element.

10. (Currently Amended) The method according to claim ~~11~~ 9, wherein the adaptive-optical element is a deformable mirror.

11. (Canceled)

12. (Canceled)

13. (Currently Amended) The method according to claim 1, further comprising utilizing a nested control loop to dovetail ~~both~~ the fields of regard for each successive tier and command response times of the fine, coarse, and ultrafine steering elements to control jitter.

14. (Previously Presented) The method according to claim 13, wherein the nested control loop receives the priori of pointing information from the network and accounts for dynamic focusing during acquisition.

15. (Previously Presented) The method according to claim 13, wherein the nested control loop includes an outer nested loop and an inner nested loop, and wherein the outer nested loop controls the coarse-steering element and fine-steering element and the inner nested loop controls the ultrafine-steering element.

16. (Previously Presented) The method according to claim 15, further comprising utilizing a fine-tracking sensor for anchoring the coarse-steering element and the fine-steering element, and utilizing a wavefront sensor to anchor the ultrafine-steering element.

17. (Currently Amended) The method according to claim 16, wherein the ultrafine-steering element is an adaptive-optical element comprising a deformable mirror anchored to a wavefront sensor comprising a curvature sensor.

18. (Previously Presented) The method according to claim 17, wherein the ultrafine-steering adaptive-optical element further relies on its own dedicated controller for commanding the deformable mirror based on acquisitions of the wavefront sensor.

19. (Currently Amended) An optical head for a free space optical communications system, said optical head utilized for transmitting and receiving modulated infrared laser beams, said optical head comprising:

an optical amplifier for amplifying an infrared laser beam to be transmitted;
a circulator coupled to the amplified infrared laser beam;
an ultrafine-steering element in optical communication with the circulator;
a fine-steering element in optical communication with the ultrafine-steering element;
a coarse-steering element in optical communication with the fine-steering element; and
a fine track sensor coupled to the modulated infrared laser beam.

20. (Previously Presented) The optical head according to claim 19, said ultrafine steering element comprising an adaptive-optical element.

21. (Previously Presented) The optical head according to claim 20, said adaptive-optical element comprising a deformable mirror.

22. (Currently Amended) The optical head according to claim 20, said adaptive-optical element adapted to utilize a high-speed curvature sensing technique.

23. (Previously Presented) The optical head according to claim 22, said adaptive optic element adapted to be dynamically focused and defocused.

24. (Previously Presented) The optical head according to claim 19, said ultrafine-steering, fine-steering, and coarse-steering elements configured in a cascaded three-tier steering element architecture.

25. (Previously Presented) The optical head according to claim 24, wherein for each successive tier within the cascaded three-tier steering element architecture, a field of regard may be tightened allowing for finer steering resolution.

26. (Previously Presented) The optical head according to claim 19, wherein said coarse-steering element has a first field of regard, said fine-steering element has a second field of regard less than the first field of regard, and said ultrafine steering element has a third field of regard less than the second field of regard.

27. (Previously Presented) The optical head according to claim 19, wherein said coarse-steering element has a first bandwidth, said fine-steering element has a second bandwidth greater than said first bandwidth, and said ultrafine-steering element has a third bandwidth greater than said second bandwidth.

28. (Previously Presented) The optical head according to claim 27, wherein jitter correction relies on a finest tilt parameter at the third bandwidth.

29. (Previously Presented) The optical head according to claim 19, wherein said coarse-steering element covers a range of about ± 45 degrees at about 20 Hz, said fine-steering element covers a range of about ± 3 degrees at about 200 Hz, and said ultrafine-steering element covers a range of about ± 100 μ rad at about 2 kHz.

30. (Previously Presented) The optical head according to claim 19, said optical amplifier comprising an erbium-doped fiber amplifier (EDFA).

31. (Currently Amended) The optical head according to claim 19, further comprising a common optical path that supports both transmitted and received beams between said circulator and said ultrafine-steering element.

32. (Previously Presented) The optical head according to claim 19, further comprising a beam splitter arranged between said ultrafine-steering element and said fine-steering element.

33. (Currently Amended) The optical head according to claim 32, said beam splitter rated for beams having a wavelength of about $1.55 \mu\text{m}$.

34. (Currently Amended) The optical head according to claim ~~20~~ 32 said fine track sensor positioned to receive beams from said beam splitter.

35. (Previously Presented) The optical head according to claim 34, wherein said fine track sensor along with said coarse-steering and fine-steering elements are utilized to track a link platform.

36. (Previously Presented) The optical head according to claim 19, said fine-steering element comprising a fast-steering mirror.

37. (Previously Presented) The optical head according to claim 19, said coarse-steering element comprising an electro-opto-mechanical assembly.

38. (Previously Presented) The optical head according to claim 34, further comprising a pointer/tracker controller electrically connected to said ultrafine, fine, and coarse steering elements and to said fine tracker sensor.

39. (Previously Presented) The optical head according to claim 21, wherein the ultrafine-steering element further comprises an embedded wavefront sensor and controller.

40. (New) An optical head for a free space optical communications system, said optical head utilized for transmitting and receiving modulated infrared laser beams, said optical head comprising:

- an ultrafine-steering element for infrared laser beam control;
- a fine-steering element in optical communication with the ultrafine-steering element;
- a coarse-steering element in optical communication with the fine-steering element; and
- a fine track sensor coupled to the modulated infrared laser beam.